In a series of three field trips, we will be studying Devonian and Pennsylvanian rock formation outcrops at separate localities. The generalized chronostratigraphy and lithostratigraphy of Devonian and Pennsylvanian rocks in Iowa are included with this handout.

From each field trip, you should prepare:

1. a stratigraphic log (this should be a copy of your field notebook, see p. 224 & 240 of attached handout).

2. a graphic columnar section for each outcrop (see example, p. 239 in attached handout). This should use the standard geologic symbols for lithology, fossils, sedimentary structures, etc., provided in the attached handout pages 376-378). Only one graphic columnar section per group need by turned in.

The final project will include:

1. A neatly presented columnar section from each field trip, formatted according to the standard for field geology.

2. A paper (approximately 12-15 pages) in which you will examine and synthesize the information of past researchers provided in their publications with your own observations from outcrops. The paper should include:

   - a detailed description of your observations of each stratigraphic unit (formations & members) studied (lithology, classification of rock types, fossils, taphonomy of fossils, sedimentary structures, etc.)

   - an interpretation of the depositional environment (as precisely as possible). This should by YOUR interpretation; you may then expand this section to include information on the regional variation and extent of each unit that you obtain from the geological literature. Make sure you distinguish your interpretations from those reported in the literature – I will be able to tell the difference! Your summary/synthesis of the pertinent literature will constitute a major component of your grade for the paper – I expect a substantial review.

   - a discussion of the geologic history of this region, beginning with the detailed view afforded by your outcrop study, and expanding into a discussion in which you place your field results into the context of the paleozoic history of the mid-continent. Again, a substantial summary of the literature is warranted.
Reference Format (Geological Society of America)

The following examples are the format of references listed in the GSA publications. Every journal has slight modifications of this format. Remember the key here is to allow the reader of your work to relocate the source of your information. The three following formats will encompass nearly any citation in the geologic literature. In the body of your writing you refer to the source of information using the following formats in parentheses at the end of the appropriate sentence of paragraph.

(LaPorte, 1967) in single authored work.
(Laporte and Newton, 1983) where there are two authors
(Laporte and others, 1990) where there are three or more authors

Journal article:
Author, year, title of article: journal name, volume, page numbers. Example:

Article in edited book:
Author, year, title of article, in editor names, ed(s)., name of book: publisher, series (if appropriate), city of publication, page numbers. Example:

Book:
Author, year, title of book: publisher, city of publication (if available), number of pages.
Assessment Protocol

I. Field Notes/Strat. Log
   Neatness                      5 pts. ______
   Completeness                 5 pts. ______

II. Stratigraphic Sections
    Organization                 5 pts.______
    Appropriate Symbols          10 pts._______
    Neatness                     10 pts._______

IV. Paper
    Description/Observations      5 pts. ______
    Dep. Env. Interpret.          15 pts.______
    Discussion of geologic history 20 pts ______
    Title/Use of Headings         5 pts. ______
    References                    10 pts.______
    Mechanics (writing/punct./spelling) 10 pts.______

    TOTAL:                      ______
preparing a columnar section, and in interpreting the section. Other geologists may use these units to locate specific parts of the sequence in the field. Ideal stratigraphic units are based on lithologic characteristics that have genetic meaning, and the more practical are also based on obvious surficial characters, such as degree of exposure, steepness of slope, thicknesses of beds, kinds of vegetative cover, and color of rock and soil. Thickness is not an important criterion provided the unit is physically distinct. A thin tuff bed in a sedimentary sequence, for example, would be a valuable unit. Disconformities should be used as contacts between units even if they seem minor.

A trial description and measurement of part of the section serve to calibrate procedures to the time available and the purpose of the project. These trials may be unnecessary if the rocks have become well known during prior field work.

Systematic measurement and description of the full section is best made

**Eocrest Si measured along Willow Crk by R. Lowe 3 Oct 83**

Base of unit I located at 42° 33' 10.5" N 115° 2' 25" W, Fire Creek quadrangle (7-3-1959 ed). Unit I has an event denuded of Wisness Grin, which is followed locally by shales of grays in unit II prove to be byxont formations.

Unit 1, 1.7m. Igneous, pebbly as forms, clean, Utah; bed widens, 1.7m thick; rocks strongly coherent, mid gray (4/0), moist;... 5-10% pebbles and cobbles of gray and W colors in matrix of mud, sorted coarse-feldsparic, subquartzose, 2 cm long; carrying... 2-5% biotite, calcite, cement, bent.

Unit 2, 52m. Bed to course 55 in distinct, 10 cm beds with 1.5 cm... porosity, 61, micaceous, silty 88, 92% gray (1-5/2), moist;... feldsparic subquartzose, with 1.2% biotite, calcite, cement... sample... spores to absent. Graptolites collected at 13.5 m.

Unit, 34m... (37.9 cm) for Si., hiatus with yellow micaceous... 88 and 12%,... 6.5, brownish gray (5 YR 6.5/2), moist... feldsparic and micaceous... tenuis, red, 1 dm... tenuis, gray, (5 YR 4-5/2), moist, 2-3 cm, with 10%... carbonaceous, leaves, 1 cm, etc.

Fig. 11-1. Field notes from a detailed description of a measured formation.
Geology in the Field

(12) covered intervals, as measured; (13) positions of key beds; and (14) positions of important samples, with number and perhaps data.

Other kinds of information that may be included are: (15) designations of formal or informal measured units; (16) an irregular edge indicating relative resistance of the rocks; (17) summary descriptions of formations or other units (especially desirable if the section will not be accompanied by an explanatory text); (18) thicknesses of units; (19) intervals of deformed rocks; and (20) symbols or numbers indicating kinds of fossils, primary structures, porosities, cements, shows of petroleum, and so on. Some of the latter features may be added directly to the lithologic column, as at (21).

Columns are constructed from the stratigraphic base upward and should be plotted first in pencil in order to insure spaces for gaps at faults and unconformities. Sections that are thicker than the height of the plate can be broken into two or more segments, with the stratigraphic base at the lower left and the top at the upper right. Bedding and unit boundaries are drawn horizontal except in detailed sections or generalized sections of distinctly non-tabular deposits, as some gravels and volcanic units (Fig. 11-15, and see Mullineaux, 1976, p. 37).

Uses of columnar sections in reports are described in Sections 16-2 and 16-3.

Stratigraphic logs are used to describe sections in the text of reports. Although telegraphic in style, they may describe each measured unit as fully as warranted, and thus present sections in greater detail than all but the most detailed columnar sections. They are not usually published unless they are the type section of a formation or member, however, they may be the main vehicle in an unpublished report.

Logs are arranged so that the youngest rocks appear first in the text. The smallest measured units are numbered to make the sequence clear. Order of presenting data should be kept as consistent as possible as in the fragment that follows:

**Smith formation**

3. Shale, black, soft, locally leaf-bearing ................. 5 m

2. Sandstone, dark gray, moderately resistant, carbonaceous, feldspathic, in beds 0.5-2 m thick, the thinner with carbonaceous 1-cm laminae; thick beds heavily burrowed ............................................. 23 m

1. Conglomerate, light gray, highly resistant, of rounded chert pebbles, fine sand matrix, imbricated .......... 2 m

Total Smith Formation ........................................ 232 m

Base of formation is an unconformity on well-exposed Byron Shale.

An additional description at the base of the log is generally used to locate the base of the log...
for long periods between stadia provide a geologic framework for
5 km long, a traverse can still be larger, but the main traverse legs stadia. Strata exposed along the slightly by the tape, as in the transit on either side of the traverse line

us extending beyond one plane larger, should probably be contin of triangulation stations (Sec tabl where structural relations section or where there is no large overall dimensions of the plane tations is done by stadia methods apic section can be accumulated this chapter.
rs in vertical position introduce ess. Vertical distances must thus using the stepping method rather 8-5. An advantage of the plane used easily to determine accurate


tional means of presenting mea tions of the units may be lettered or the column may be accompan all box for each lithologic symbol lumn. No explanation is included : patterns are shown in Appendix ollowing elements of a stratigr Fig. 11-15 by numbers: (1) title, (2) ther the section is single (made piece from two or more section ames of geol{s} and date of (4) graphic scale; (5) map or des graphic units, if known; (7) lesser ones and boundaries of rock units d of standard lithologic patterns,

kness of tectonic gaps, if known.

<table>
<thead>
<tr>
<th>Stage/Series</th>
<th>Formation</th>
<th>Unnamed Group</th>
<th>Graphic column/section</th>
<th>Samples and data</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>16</td>
<td>Grayflow Formation</td>
<td>500</td>
<td></td>
<td></td>
<td>Tuff, vitro, diabase, partially welded for 35 m above base.</td>
</tr>
<tr>
<td>15</td>
<td>Companion Formation</td>
<td>50</td>
<td></td>
<td></td>
<td>Completisite red alluvium with bed of chert and tuff 0 51 3 cm.</td>
</tr>
<tr>
<td>14</td>
<td>Microclastic Sandstone with beds of sandstone and shale 2.7 m thick, 3.2 m thick.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Arroyo Zone</td>
<td>100</td>
<td></td>
<td></td>
<td>Sanstone, gray quartz sandstone 3.2 m thick.</td>
</tr>
<tr>
<td>12</td>
<td>Arroyo Zone</td>
<td>100</td>
<td></td>
<td></td>
<td>Limestone, chalcedony in upper part.</td>
</tr>
<tr>
<td>11</td>
<td>Arroyo Zone</td>
<td>100</td>
<td></td>
<td></td>
<td>Limestone, chalcedony in upper part.</td>
</tr>
<tr>
<td>10</td>
<td>Arroyo Zone</td>
<td>100</td>
<td></td>
<td></td>
<td>Limestone, chalcedony in upper part.</td>
</tr>
</tbody>
</table>

Fig. 11-15. Columnar section with title and accessory data. Numbered items are identified in the text.
B glacial tills
   Mesa Falls Volcanic Ash
   Huckleberry Ridge Volcanic Ash

C glacial tills

TERTIARY

Salt & Pepper sands

CRETACEOUS

"Manson" Group
"upper Colorado" Group
   Niobrara Formation
Fort Benton ("lower Colorado ") Group
   Carlile Shale
   Greenhorn Limestone
   Graneros Shale
   Dakota Formation
      Woodbury Member
      Nishnabotna Member
   Windrow Formation
      Ostrander Member
      Iron Hill Member

JURASSIC

PENNSYLVANIAN (subsystem of Carboniferous System)

Fort Dodge Formation

Wabaunsee Group
   Wood Siding Formation
   Root Formation
      French Creek Shale
      Jin Creek Limestone
      Friedrich Shale
   Stotler Formation
      Grandhaven Limestone
      Dry Shale
      Dover Limestone
   Pillsbury Formation
      Nyman Coal
   Zeandale Formation
      Maple Hill Limestone
      Wamego Shale
      Tarkio Limestone
   Willard Shale
   Emporia Formation
      Elmont Limestone
      Harveyville Shale
Spring Branch Limestone
Kanwaka Shale
Oread Formation
  Kemper Limestone
  Hawnader Shale
  Plattsburg Limestone
  Heebner Shale
  Leavenworth Limestone
  Snyderville Shale
  Toronto Limestone

Douglas Group
Lawrence Formation
Cass Limestone
  Shoemaker Limestone
  Little Pawnee Shale
  Haskell Limestone
Stranger Formation
  Iatan Limestone
  Weston Shale

Lansing Group
South Bend Limestone
  Kitaki Limestone
  Gretna Shale
  Little Kaw Limestone
Rock Lake Shale
Stanton Formation
  Stoner Limestone
  Eudora Shale
  Captain Creek Limestone
Vilas Shale
Plattsburg Formation
  Spring Hill Limestone
  Hickory Creek Shale
  Merriman Limestone

Kansas City Group
Lane Shale
Wyandotte Formation
  Argentine Limestone
  Quindaro Shale
Liberty Memorial Shale
Iola Formation
  Raytown Limestone
  Muncie Creek Shale
  Paola Limestone
Chanute Shale
Dewey Formation
Mine Creek Shale
Myrick Station Limestone
Anna Shale
Labette Formation
Mystic Coal
Marshall Coal
Stephens Forest Formation
Higginsville Limestone
Blackwater Creek Shale
Houx Limestone
Clanton Creek Limestone
Little Osage Shale
Morgan School Shale
Summit Coal
Mouse Creek Formation
Blackjack Creek Limestone
Excello Shale
Cherokee Group
Swede Hollow Formation
Mulky Coal
Bevier Coal
Wheeler Coal
Ardmore Limestone
Oakley Shale
Whitebreast Coal
Floris Formation
Carruthers Coal
Laddsdale Coal
Spoon Formation
Kalo Formation
Cliffland Coal
Blackoak Coal
Kilbourn Formation
Caseyville Formation
Wyoming Hill Coal
Wildcat Den Coal

MISSISSIPPIAN (subsystem of Carboniferous System)

Pella (St. Genevieve) Formation

St. Louis Formation
Waugh Member
Verdi Member
Yennergis Sandstone
Croton Member

Spergen Formation

Augusta Group
Warsaw Formation
Iowa City Member  
Gizzard Creek Member  
Coul Falls Member  
**Little Cedar Formation**  
Hinkle Member  
Eagle Center Member  
Chickasaw Shale  
Bassett Member  
Rapid Member  
Curtis Bridge Bed  
Solon Member  

**Wapsipinicon Group**  
**Pinicon Ridge Formation**  
Davenport Member  
Spring Grove Member  
Keenwood Member  
**Otis Formation**  
Cedar Rapids Member  
Coggon Member  
**Spillville Formation**  
Lake Meyer Member  
**Bertram Formation**  

**SILURIAN**

**Gower Formation**  
Brady Member  
Anamosa Member  
LeClaire Member  
**LaPorte City Formation**  
**Scotch Grove Formation**  
Palisades-Kepler Member  
Waubeeck Member  
Buck Creek Quarry Member  
Welton Member  
Johns Creek Quarry Member  
**Hopkinton Formation**  
Picture Rock Member  
Farmers Creek Member  
Marcus Member  
Sweeney Member  
**Waucoma Formation**  
**Blanding Formation**  
**Tete des Morts Formation**  
**Mosalem Formation**

**ORDOVICIAN**

**Maquoketa Formation**  
Neda Member